

MEMORANDUM

**SUBJECT:** Region 10 Response to National Remedy Review Board and Contaminated Sediments Technical Advisory Group Recommendations for the East Waterway Operable Unit of the Harbor Island Superfund Site

**FROM:** Sheryl Bilbrey, Director  
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**TO:** Christine Poore, Chair  
National Remedy Review Board

Karl Gustavson, Chair  
Contaminated Sediments Technical Advisory Group

EPA Region 10 appreciated the opportunity to present our proposed cleanup for the East Waterway Operable Unit of the Harbor Island Superfund Site to the national Remedy Review Board (NRRB) and the Contaminated Sediments Technical Advisory Group (CSTAG). Region 10 has considered your input in development of its Proposed Plan and Record of Decision. Our responses to your comments are provided below.

## **Long-Term Protectiveness/Interim Remedy/Applicable or Relevant and Appropriate Requirement Waiver**

### ***NRRB/CSTAG Comment:***

*Based on the information provided to the boards, it is unclear whether the proposed remedial alternatives can achieve the NCP's threshold criteria of long-term protectiveness and compliance with applicable or relevant and appropriate requirements (ARARs) (40 CFR § 300.430(f)). This lack of clarity primarily relates to the Region's use of 2 ppb total polychlorinated biphenyls (PCBs) as a preliminary remediation goal (PRG) in sediments based on natural background as defined by the Washington Model Toxics Control Act's (MTCA) and Sediment Management Standards (SMS). The Region considers that PRG to be an ARAR and plans to use it as a measure of protectiveness. However, based on the information provided to the boards, it appears that site-specific background concentrations are higher than 2 ppb. For example, the natural recovery model estimates that final East Waterway PCB sediment concentrations will be close to 40 ppb based on the current estimates of contaminant loading from the Green/Duwamish River. Therefore, it is unclear how the proposed remedial alternatives will achieve the PRG, ARAR and protectiveness criteria. The boards understand that efforts are underway to address upstream sources of contamination and better estimate the incoming contaminant load from the Green/Duwamish River.*

***Recommendation 1:*** *The boards recommend that the Region re-evaluate contaminant load input parameters and collect incoming suspended and settleable solids data to clarify sediment and contaminant mass loading.*

**Region 10 Response:** The current conceptual site model uses available information from the SRI and LDW sediment transport model to define the sediment mass and contaminant concentration loadings into the East Waterway. Although this site model is robust, it does not include calibration with data specific to the EW, particularly incoming solids. Region 10 agrees that additional information such as settleable solids data from the Sill Reach should be collected and would address some of the uncertainty associated with the long-term estimates of post-remedial sediment concentrations.

At this time, the Washington Department of Ecology is conducting an extensive effort, called the Pollutant Loading Assessment (PLA) to identify sources of contamination within the Duwamish River watershed and control those that pose a risk of recontamination to the river. This multi-year effort is intended to reduce incoming contamination to the system. Through these efforts, it is expected that the concentrations of incoming sediments will be reduced. While this source control work is being conducted within the upper watershed, it is not possible to accurately compute the concentration of incoming sediments at this time. Revising these estimates is a goal for efforts by the Department of Ecology and EPA. As sources are controlled and upstream sediment concentrations decrease, EPA will conduct the monitoring and sampling needed to determine a regional background.

However, in an effort to maintain progress toward a cleanup action, the Region will not be conducting additional data collection or modeling prior to issuing the ROD. Data collection and modeling could take several years, delaying issuance of the Proposed Plan and/or Record of Decision. Modeling may occur during the design phase of the selected remedy as additional sampling is conducted and modeling input parameters are refined. The decision documents will indicate the need for pre-design studies including data collection to refine the sediment and contaminant mass loading estimates.

*Recommendation 2: The boards recommend that a site-specific background concentration be determined and used to develop background-based PRGs.*

**Region 10 Response:** The process for establishing a background concentration in this portion of Puget Sound is a complex issue requiring substantial time and resources to complete. While the Region supports the development of a site-specific background concentration, we do not want to delay implementation of the remedial action for several years while this is developed. If, in the future, a site-specific background value is finalized, it would be implemented by the Region in a future decision document.

Currently, the Washington State Department of Ecology (Ecology) is conducting a Pollutant Loading Assessment (PLA) for the Green/Duwamish River watershed. This effort will likely to play into potentially establishing a regional background value. This substantial EPA-Ecology joint effort includes assessing and characterizing upstream sources of contamination and collection of upstream loading data. The PLA is underway but will take several years to complete. As stated previously, Region 10 does not believe the ROD should be delayed until a regional background value is established.

*Recommendation 3: The decision documents should also clarify how long-term protectiveness will be evaluated both in terms of sediment and contaminant mass loading as well as regional and site-specific background concentrations.*

**Region 10 Response:** To address long-term protectiveness, the Region will evaluate and incorporate appropriate loading data from the PLA as it becomes available, collect additional data during design and baseline sampling, and incorporate data collected as part of long-term monitoring.

Although the FS model predicts that long-term concentrations for some COCs may be higher than the ARAR-based PRGs, revised predictions based on the source control, data collection, and modelling efforts described in the previous responses may result in COC concentrations lower than the current model projections and below the cleanup level. This is likely to be true for some but not all COCs. For those COCs with long-term concentrations above the cleanup levels, the Washington State Sediment Management Standards includes a path forward for evaluating compliance with the ARAR. In the EW Proposed Plan, the PRGs for contaminants of concern are determined through an evaluation of risk-based concentrations, practical quantification limits, and background. For this site, the PCB cleanup level is based on the natural background concentration to comply with the SMS ARAR. SMS allows for this cleanup level to be increased to the  $10^{-5}$  excess cancer risk level or a regional background level if it is not technically possible to achieve the natural background concentration. For the RME tribal seafood consumption scenario at EW, the  $10^{-5}$  excess cancer risk level is below the natural background concentration, so any adjustment would be to regional background. If a regional background level is developed for PCBs that is greater than the natural background concentration, and if it is not technically possible to achieve the natural background concentration, the Region may modify the cleanup decision for the Site and set the regional background concentration as the remediation goal for PCBs.

*Recommendation 4: If the Region chooses to propose a final remedy without first developing a site-specific background value, the boards recommend that the Region evaluate whether its identification of MTCA as an ARAR can be waived given that the information provided to the boards demonstrates that the proposed alternatives are unlikely to attain the identified ARAR (see CERCLA § 121(d)(1); 40 CFR § 300.430(f)(1)(ii)(C)). Or, if the Region continues to use the 2 ppb PCB PRG, then the boards recommend the Region propose an interim remedy since it appears unlikely that the preferred alternative can achieve compliance with this ARAR.*

**Region 10 Response:** The Region understands the board's concerns that the modeling estimates show a long-term PCB sediment concentration higher than the PRG; however, the modeling projections for the East Waterway include significant uncertainty due to necessary assumptions about sediment transport within the site, and unknown future incoming sediment concentrations due to ongoing upstream remedial actions and source control. Given the uncertainty, the Region believes it can meet the requirements of the SMS ARAR through either achieving the PRG or developing a regional background level as described in the previous response.

Considerable source control has occurred and is ongoing. Source control is a necessary component of all remedies where there is ongoing contaminant loading and a featured consideration in EPA TI waiver guidance (EPA, 1993) and sediment cleanup guidance (EPA, 2005). These source control actions are expected to decrease incoming contaminant concentrations, but the extent of this reduction is unknown at this time. Once long-term monitoring shows that COC pollutant concentrations reach a steady state at concentrations above the ARAR-based cleanup levels after 10 or more years of natural recovery, the SMS ARAR allows the sediment cleanup level to be increased from the natural background concentration to the regional background level, if one exists. EPA will describe this process in the Proposed Plan and ROD as appropriate. Once a regional background concentration is established for the Site, a TI waiver would only become necessary if monitoring shows that it is not technically possible to achieve the regional background level. Such a waiver would require an analysis demonstrating that further practicable cleanup would not reduce these concentrations to the ARAR-based cleanup level, along with a finding that further source control cannot be practicably undertaken.

The Region believes that tribal treaty-based fishing rights are a basis for the Region to be particularly cautious and conservative in the development of such waivers. In this instance, this factor reinforces the Region's preference, to the extent such waivers may be used, for basing waivers on empirical data which is less likely to require subsequent revision rather than waivers based on current modeling and its inherent comparative uncertainties.

EPA (U.S. Environmental Protection Agency). 1993. *Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration*. EPA/540-R-93-080. September 1993.

EPA. 2005. *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*. EPA-540-R-05-012. December 2005.

## **Applicable or Relevant and Appropriate Regulations**

### ***NRRB/CSTAG Comment:***

*Recommendation 5: The boards recommend the Region review and update FS Table 4-1, as necessary. For example, some ARARs appear to not be pertinent to the preferred alternative (e.g., the table provides a potential ARAR for groundwater quality, but the preferred alternative does not address groundwater). Some “ARARs” may be more appropriately categorized as “To Be Considered” criteria.*

**Region 10 Response:** The Region is in the process of reviewing this table; an updated version will be included in the Record of Decision.

## **Diver Assisted Dredging Contingency Actions**

### ***NRRB/CSTAG Comment:***

*In the materials provided to the boards, the Region states that, “diver assisted dredging will be considered as a contingency if monitoring indicates that in-situ treatment is not protective.” The boards were unable to identify performance metrics, such as sediment contaminant concentrations, that the Region will use to determine if “in-situ treatment is not protective.”*

***Recommendation 6:*** *The boards recommend that the Region assess the recontamination potential from, or to, under-pier areas; clarify the anticipated post-remediation sediment concentrations; and identify the concentration(s) that would trigger a switch from the in-situ treatment remedy to the diver-assisted dredging contingency remedy.*

**Region 10 Response:** The Feasibility Study included detailed modeling of recontamination potential to and from the underpier areas as well as anticipated post-remediation sediment concentrations. Underpier-open water sediment exchange occurs primarily through propwash and was modeled as 25% of the underpier sediment volume exchanging with open-water sediment every 5-years. Appendix J of the FS went on to evaluate the sensitivity of this assumption, using a low-end rate of 5%, and high-end rate of 50%. For these two scenarios, the FS estimated the anticipated post-construction sediment PCB SWACs [based on alternative 2B(12)] as 62 and 84 µg/kg dw at 5 years post-construction, and 56 and 57 µg/kg dw at 40-years post-construction. The area impacted by this anticipated mixing is small compared to the rest of the waterway and thus this shows that over the long-term, the impact of potential recontamination from underpier sediments was limited, especially compared to other sources of potential recontamination. The full sensitivity analysis showed that the long-term SWAC was most sensitive to the concentration of incoming sediment from the Green River). As described above, the SMS ARAR allows the cleanup level to be increased up to a regional background concentration once such a concentration is established for the Site.

The Region has detailed the proposed contingency remedy and trigger action in the Proposed Plan. As was presented to the boards, the region is proposing diver-assisted hydraulic dredging as the contingent remedy. The trigger for this action will be a sediment porewater concentration performance goal of approximately 80% reduction. Post-construction sediment porewater monitoring will be used to determine if this trigger level is met. Given that it will be several years before such a contingency action may be necessary (due to time required for baseline monitoring, design, construction, and subsequent monitoring), the Region may consider other (and newer) remediation technologies if deemed appropriate at the time. Such a change would be implemented in an appropriate decision document.

## **Remedial Action Objectives**

### ***NRRB/CSTAG Comment:***

*The Region described how it considered the 11 principles identified in the 2002 principles directive. In its written discussion, on page 28, the Region states that: “The remediation area was first developed based on the protection of benthic invertebrates (Remedial Action Objective 3) because remedial action levels based on Remedial Action Objective 3 risk drivers (including PCBs and arsenic) generate the majority of the remediation area. These remedial action levels were based on Washington State’s sediment management standards benthic numerical criteria (these are the risk-based threshold concentrations for benthic community) and the tributyltin risk-based threshold concentration.” From that statement and other materials provided to the boards, it is unclear whether Remedial Action Objective (RAO) 3 was developed in accordance with CERCLA risk assessment guidance.*

*Recommendation 7: The boards recommend the Region clarify that a CERCLA risk assessment was conducted and that unacceptable risks identified in the assessment were the basis of RAO 3.*

**Region 10 Response:** A CERCLA risk assessment was conducted for the EW and the identification of unacceptable risks were the basis of RAO-3.

The BERA included the development of assessment and measurement endpoints for the benthic community. As indicated in Table A.2-49 of the Ecological Risk Assessment, the assessment endpoint for the benthic community was “maintenance of the benthic invertebrate community in EW sediment.” The measurement endpoints included the following:

- Comparison of sediment chemical concentrations to effects-based threshold values;
- Site-specific sediment toxicity tests (acute and chronic) relative to reference; and,
- Comparison of benthic tissue concentrations to critical threshold values tissue-residue TRVs based on survival, growth, and reproduction.

Consistent with CERCLA, exposure point concentrations (EPCs) in sediment and tissue were compared to TRVs. For an evaluation of benthic toxicity, the EPCs were equal to the surface sediment chemical concentration at each grab sampling location. The Washington State Sediment Management Standards (SMS) were used to establish the chemical and toxicity thresholds for the benthic community. The SMS chemical criteria are based on relationships between sediment contaminant concentrations and adverse effects on benthic invertebrates. TRV exceedances were confirmed by conducting toxicity tests of EW sediments. Toxicity tests included evaluations for both short-term (acute) and long-term (chronic) exposures. The methods used to develop the SMS criteria are consistent with CERCLA ecological risk assessment methodology.

As indicated above, the TRVs for the benthic community were the Sediment Quality Standards (SQS) and Cleanup Screening Levels (CSL) from the State of Washington’s Sediment Management Standards (SMS). The SQS and CSL are regionally developed effects-based criteria for Puget Sound sediment that are promulgated, chemical-specific values. The lower SQS value is defined as the lower Apparent Effects Threshold (LAET) for Puget Sound. LAETs were developed with concomitant sediment chemistry and acute and chronic toxicity testing datasets. The upper CSL value is the sediment concentration above which some action is required to remediate site sediments. The CSL is based on 2\*LAET for Puget Sound.

As presented in the risk characterization section of the BERA, a hazard quotient (termed an “exposure factor” or EF in the BERA) was calculated for 243 locations in the EW. A total of 167 locations had HQ values greater than 1, with 30 COPCs having HQ>1. Total PCBs most frequently (65%) exceeded its SQS criterion, followed by mercury (19%), and 1,4-dichlorobenzene (13%).

Site-specific sediment toxicity tests were subsequently conducted at 51 locations. Sediment tests included acute and chronic endpoints and were conducted with three species, representing three different phyla. Responses in the bioassays were interpreted based on both statistical and biological significance. Sediment from half of the EW locations, representing approximately 60% of the waterway, exceeded both statistical and biological criteria. Areas requiring action to be protective of benthic invertebrates were based on the combination of chemical and biological evaluations.

Finally, tissue levels in benthic invertebrates were compared to critical tissue levels (CTLs) for benthos. Benthic macroinvertebrate tissues were collected from 13 areas within the EW and EPCs were calculated for TBT and total PCBs. EPCs were compared the NOAEL and LOAEL TRVs developed for the project. The resulting HQ values were presented in Table A.6.1.1.2 of the BERA. LOAEL-based HQ values for TBT were greater than one for two of the study areas in the EW. For total PCBs, all HQ values were below one.

Based on the BERA, the Region believes that the risks to benthic invertebrates were evaluated in manner consistent with CERCLA guidance and indicate that there is unacceptable risk for benthic invertebrates supporting RAO-3.

*Recommendation 8: The boards recommend the Region further explain its use of Washington State’s sediment management standards for benthic invertebrates (RAO 3). Providing additional explanation of RAO 3 based on the State standards would clarify the rationale for the site’s selected remedial footprint.*

**Region 10 Response:** The State SQS and CSL are promulgated (WAC 173-204-570), chemical-specific values developed to protect benthic invertebrates. The applicable and relevant State regulations require cleanup as close as practicable to the SQS but in no case above the CSL for surface sediments. The SMS chemical criteria were developed from toxicity tests and community surveys using test species that represent a sensitive portion of the diverse benthic invertebrate community present in the EW. The toxicity test species included crustaceans, polychaetes, and bivalve larvae, which are considered to represent taxonomic groups most sensitive to chemical exposure (Hyland et al. 1999).

SMS chemical criteria were developed for specific chemicals based on AETs, no effects and lowest observable effects thresholds that were empirically-derived from a dataset of Puget Sound field-collected sediment samples. Two published studies have assessed the ability of AETs to estimate adverse effects in Puget Sound (Barrick et al. 1988; Gries and Waldow 1996). The study by Barrick et al. (1988) calculated overall reliability values between 50 and 96% for benthic community, amphipod, Microtox®, and oyster larvae AETs. The study by Gries and Waldow (1996) calculated overall reliability values between 65 and 85% for amphipod and echinoderm AETs. In order to account for uncertainties associated with the predictive ability of the sediment criteria, SMS includes biological criteria applied to toxicity tests.

The resulting footprint for RAO 3 is based on the PRGs (sediment values) and toxicity test for spatial extent.



*The ecological risk assessment presented to the boards appears to suggest that there is no risk to crabs or fish based on the surface water evaluation. The Region's assessment concludes that no contaminants of concern (COCs) were identified for fish or crabs based on the surface water evaluation, yet RAO 4 (reduce to protective levels, risks to crabs and fish from exposure to contaminated sediment, surface water, and prey) includes surface water. It was not clear from the information provided to the boards whether surface water needs to be included in RAO 4.*

*Recommendation 9:* *The boards recommend the Region consider modifying RAO 4 to exclude surface water or provide some explanation as to why the ecological risk assessment supports its inclusion in RAO 4.*

**Region 10 Response:**

While unacceptable risk was not identified for fish and crab from surface water as a separate medium, the food web model developed for the EW OU identified surface water as a component of the unacceptable risks associated with fish and shellfish tissue concentrations. As contaminants in both sediment and surface water contribute to the unacceptable risks for fish and crab, they are included in RAO-4.

## **Ecological Risk**

### ***NRRB/CSTAG Comment:***

*In the package presented to the boards, the ecological risk assessment summary was presented in the format of species or receptor of concern to represent various organism groups and receptor group hazard quotients. Although this information may be relevant, it is not clear how that assessment aligns with Agency ecological risk assessment guidance. For example, the “Ecological Risk Assessment Guidance for Superfund” (ERAGS, EPA 540-R-97-006, OSWER Directive #9285.7-25, June 1997) and “Guidelines for Ecological Risk Assessment” (EPA 630-R-95-002F, April 1998) stress the importance of presenting ecological risks in terms of assessment endpoints and measures of effects. The materials provided to the boards do not discuss the ecological risk assessment in those terms.*

*Recommendation 10: The boards recommend that the Region describe in its decision documents the ecological risks and the subsequent risk characterization in terms consistent with Agency guidance.*

**Region 10 Response:** The baseline ecological risk assessment conducted for the EW followed both the EPA 540-R-97-006 (ERAGS: EPA 1997) and EPA 630-R-95-002F (EPA 1998) guidance. The EW BERA followed each of the eight steps identified in the ERAGS guidance and is documented in the BERA (Appendix A of the Remedial Investigation).

Assessment endpoints and lines of evidence (measure of exposure and measure of effect) were developed for each of the receptors of concern (ROCs). For the EW ROCs, survival, growth, and reproduction were the measurement endpoints that were evaluated for all ROCs. Biomarker, behavioral, and histological endpoints were considered for inclusion as measurement endpoints only if they could be linked to adverse effects on the ecologically relevant assessment endpoints, such as growth, mortality, or reproduction. Additional information regarding the BERA are included in responses to Recommendations 7 and 8.

The draft Proposed Plan will discuss ecological risk in terms that are consistent with the ERAGS process. The Region will ensure that the future decision documents present ecological risk in terms of assessment endpoints and measures of effects.

## **Human Health Risk**

### ***NRRB/CSTAG Comment:***

*The package presents the human health risk assessment results for tribal and Asian/Pacific Islander seafood consumption exposure scenarios, but not other consumers, such as recreational anglers. The Region determined that the preferred alternative will reduce the excess cancer risk from fish consumption in the adult tribal reasonable maximum exposure (RME) scenario from  $1 \times 10^{-3}$  to  $2 \times 10^{-4}$ . This post-remedy excess cancer risk is at the upper bound of the risk range identified in the NCP, 40 CFR § 300.430(e)(2)(i)(A)(2).*

*Recommendation 11: The boards recommend that the Region consider presenting the recreational angler RME to demonstrate the preferred alternative's risk reduction and level of protection to be achieved for a wider range of consumers.*

**Region 10 Response:** The HHRA included a generalized RME scenario based on a set number of meals per month. The consumption rate for this scenario was divided among different seafood types and approximated a recreational fisher consumption rate. This scenario was included for comparative purposes only and was not included for setting RBTCs for the site. The results of this scenario will be included in the PP and ROD to indicate the relative risk reduction achieved by the remedial alternatives across a range of seafood consumption rates. However, this scenario is for comparative purposes only and will not be used to set risk-based PRGs.

*Based on information provided to the boards, the baseline human health risk assessment (BHHRA) for the East Waterway site was completed in 2012. Since that time, the Agency has updated guidance associated with conducting baseline risk assessments, including identifying exposure parameters ("Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors," OSWER Directive 9200.1-120, February 2014). Additionally, EPA has updated several contaminants' toxicity information, including benzo[a]pyrene, in its Integrated Risk Information System database (on January 1, 2017).*

*Recommendation 12: The boards recommend that the Region review the BHHRA and revise components based on the updated information.*

**Region 10 Response:** Based on a comparison of exposure factors in the 2012 Baseline HHRA (Windward 2012) and the 2014 OSWER tables, the only recalculation of risk needed is an update of cPAHs risks to account for the IRIS BaP cancer potency factor update.

With the exception of soil incidental ingestion, soil adherence factors, and worker body weight (for the habitat worker scenario only) all exposure factors used in the HHRA were either similar to those in the OSWER 2014 directive or were site-specific.

The impact of the values used in the HHRA for both soil adherence factor and body weight in the current HHRA would be a more conservative estimate of risk. In addition, the use of a higher soil adherence factor for sediment may be considered a site-specific exposure factor because wetted sediments are expected to have higher skin adherence than soils.

The incidental ingestion rate for sediment used in the current netfishing scenario (0.05 g/d) was lower than that of the OSWER directive (0.1 g/d), which may underestimate risk. However, the change in estimated risk is predicted to be minimal. In addition, the lower ingestion rate for netfishing may be considered a site-specific exposure factor for a non-typical application (wetted sediments as opposed to soil). While the Region does not believe that a recalculation of risk is warranted to account for incidental ingestion, the ROD will include a statement regarding uncertainties.

The Region has modified the risk calculations and the RBTCs for cPAHs based on the IRIS BaP update. As a result of the revised human health risk calculations, cPAHs are no longer a COC for the netfishing scenario for RAO-2 (Direct Contact). cPAHs remain a COC for clamming but are no longer considered a risk driver and no longer have a RAL for sediment cleanup under RAO-2. cPAHs remain a COC and risk driver for RAO-1 (seafood consumption). The region will include these changes in the Proposed Plan and ROD.

*The information in the package provided to the boards was unclear as to how the Region assessed unacceptable risk within the CERCLA framework, as described in Agency guidance, such as the “Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions,” OSWER Directive 9355.0-30. The cumulative baseline human health risk should include all media that the RME scenarios indicated are appropriate to combine.*

*Recommendation 13:* *The boards recommend that the Region clearly justify the need for remedial action for each medium based on an unacceptable risk.*

**Region 10 Response:** Region 10 agrees and will ensure that the Proposed Plan and ROD describe the risks associated with each medium included in the RAOs, consistent with OSWER Directive 9355.0-30, which states that remedial action is generally warranted when “a cumulative site risk to an individual using reasonable maximum exposure assumptions for either current or future land use exceeds the  $10^{-4}$  lifetime excess cancer risk end of the risk range”, and that . . . “the cumulative site baseline risk should include all media that the reasonable maximum exposure scenario indicates are appropriate to combine.” While unacceptable risks were not associated with surface water as a separate medium, it is a component of ecological and human health risk because 1) these risks were based (partly) on fish and shellfish tissue concentrations and 2) the food web model shows that contamination in surface water and sediments contribute to COC concentrations in tissue that then result in human health risks from consumption of seafood and ecological risks to fish and crab.

*Recommendation 14:* *The boards recommend that in the decision documents, the Region be clear that the CERCLA human health risk analysis is separate and distinct from the potential ARARs analysis.*

**Region 10 Response:**

The Region will make it clear in the Proposed Plan and ROD that the HHRA is separate and distinct from the incorporation of ARARs. Consistent with CERCLA, the HHRA was developed as a component of the SRI, prior to the preparation of the FS and the identification of ARARs. Also consistent with CERCLA, the baseline HHRA incorporated a variety of site-specific factors for each receptor group. In particular, the HHRA includes exposure factors for tribal fishers and ethnic subpopulations that have different exposure pathways (e.g. netfishing) and higher ingestion rates. The HHRA was conducted in a manner consistent the “Framework for selecting and using tribal fish and shellfish consumption rates for

risk-based decision making at CERCLA and RCRA cleanup sites in Puget Sound and the Strait of Georgia.” Issued by the Region in 2007.

The development of RAO-1 and RAO-2 was based on the findings of the HHRA. The ARARs were then incorporated in the development of the PRGs for those objectives. The PP and ROD will clearly separate the HHRA and the ARARs analysis.

## **Waste Characterization**

### ***NRRB/CSTAG Comment:***

*The boards noted the estimated cost associated with dredged sediment disposal is approximately 35 percent of the estimated remedial cost (approximately \$100M). In the materials presented to the boards, the preferred alternative seems to contemplate disposal in a Resource Conservation and Recovery Act (RCRA) Subtitle D landfill, which only accepts non-hazardous solid waste. However, it is unclear from the materials provided to the boards that the Region has determined that removed sediment would in fact not be RCRA hazardous waste.*

*Recommendation 15: The boards recommend the Region re-evaluate whether contaminated sediment or other materials removed from the East Waterway may be RCRA hazardous waste that should be disposed of in a Subtitle C landfill.*

**Region 10 Response:** The sediment dredged from the East Waterway is not a listed waste, and prior to disposal it will undergo TCLP testing to verify if it is a characteristic hazardous waste. During the East Waterway Phase 1 removal action in 2004 and 2005, most of the dredge material went to a Subtitle D landfill and none required disposal at a Subtitle C landfill. Chemical analysis of sediment remaining after the removal action indicate that it is not more contaminated than the sediment removed during the removal action. For this reason, the Region anticipates the dredged material will be disposed of at a RCRA Subtitle D landfill.

*Recommendation 16: The boards recommend that the Region consider whether there are local disposal options or beneficial use applications for the dredged sediment to reduce the cost.*

**Region 10 Response:** Beneficial use was evaluated early in the Feasibility Study process and determined to have low implementability. Although the Region does not expect the dredged material to be classified as hazardous, it is unlikely to be below the state cleanup levels for unrestricted use in either water or on land. Therefore, significant treatment would likely be required for beneficial use. However, if the parties want to propose reuse of less contaminated sediment, EPA would evaluate the proposal based on risk and compliance with ARARs (or applicable environmental regulations for off-site use).

## **Remedy Performance**

### ***NRRB/CSTAG Comment:***

*In the information provided to the boards, the use of an in-situ treatment such as activated carbon was identified for use in the under-pier areas. A concern of whether sorptive aggregate would remain stable on the steep side slopes adjacent to active berthing areas was raised during the review.*

*Recommendation 17: The boards recommend that during design, the Region consider reactive sorption mats for these slopes.*

**Region 10 Response:** The decision documents define in situ treatment as “activated carbon or other sequestering agent.” The intent of this broad language is to allow for the specific form of sequestering agent and the application method to be determined during design. The Region understands the boards’ concerns about stability and will consider sorptive mats during design. Given numerous design constraints, the final design could include a combination of sorptive aggregate, sorptive mats, or other in situ treatments that are deemed suitable.

*Residual site contamination post-implementation of the preferred alternative is estimated to result in non-carcinogenic hazard quotient as high as 10, which is outside of the CERCLA acceptable risk range. Therefore, it appears that institutional controls may be essential for the preferred alternative to be protective of human health and the environment. Institutional controls are not discussed in detail in the materials provided to the boards.*

*Recommendation 18: The boards recommend that the decision documents include a detailed description of proposed institutional controls as well as how the institutional controls’ performance will be monitored and evaluated in support of a protective remedy.*

**Region 10 Response:** The Region agrees that institutional controls will be an important component of the preferred alternative to ensure protectiveness of human health and the environment. The decision documents will detail institutional controls to be implemented as part of the remedy, which will include fish advisories, waterway use restrictions, and land use restrictions. Information regarding implementation, and community involvement will be included in the decision documents.

*The boards note that the preferred alternative appears to rely, in part, on the assumption that contaminant loading from upstream and upland sources will diminish over time. The Region assumes that sources, such as combined sewer overflows and other Clean Water Act-regulated outfalls, will not contribute the same quantity of contamination over time because Washington has pollution reduction programs in place for those sources.*

*Recommendation 19: The boards recommend that the decision documents clearly define these and other sources’ incoming loads and, if necessary, include a monitoring program to verify continued contaminant load reduction from these sources.*

**Region 10 Response:** The Region has completed and supported (through activities lead by other agencies) several source investigation and source control activities, as is documented in the Administrative Record. Most notably the Washington Department of Ecology (Ecology) is currently

working on a comprehensive pollutant loading assessment (PLA) for the Green-Duwamish Watershed as explained earlier. The goal of the PLA is to determine ways of identifying and reducing ongoing sources of pollution in the entire watershed leading to the East Waterway. In addition, incoming lateral loads are being addressed by routine cleanouts of the drain lines and improved CSO treatment.



## **Target Fish and Shellfish Tissues Concentrations**

### ***NRRB/CSTAG Comment:***

*In the information provided to the boards, the Region did not identify the contaminant concentrations in resident fish and shellfish that are to be achieved by the remediation. The boards consider tissue concentrations to be the most direct risk performance measure of the RAO to “Reduce risks associated with the consumption of contaminated resident EW fish and shellfish...” Fish and shellfish derive their COC concentrations from both sediments and surface water in proportions that can only be estimated. Based on those estimates, the degree to which this CERCLA action will reduce fish and shellfish tissue concentrations appears to be highly uncertain. To ensure that the achievement of the RAOs can be measured, the 2017 OLEM Directive (9200.1-130) on Remediating Contaminated Sediment Sites states “RAOs should be supported by statements that quantitatively describe the condition to be achieved by the remedy (e.g., expected concentrations in sediments or fish or expected levels of sediment toxicity) and the estimated timeframe for achieving the objective.”*

*The package presented to the boards discusses that long-term monitoring will be conducted for 20 years post-remedy implementation. However, Principle 11 in the principles directive states:*

*“Monitoring should normally be conducted during remedy implementation and as long as necessary thereafter to ensure that all sediment risks have been adequately managed. Baseline data needed for interpretation of the monitoring data should be collected during the remedial investigation. Depending on the risk management approach selected, monitoring should be conducted during implementation in order to determine whether the action meets design requirements and sediment cleanup levels, and to assess the nature and extent of any short-term impacts of remedy implementation. This information can also be used to modify construction activities to assure that remediation is proceeding in a safe and effective manner. Long-term monitoring of indicators such as contaminant concentration reductions in fish tissue should be designed to determine the success of a remedy in meeting broader remedial action objectives. Monitoring is generally needed to verify the continued long-term effectiveness of any remedy in protecting human health and the environment and, at some sites, to verify the continuing performance and structural integrity of barriers to contaminant transport.”*

*Recommendation 20: The boards recommend that the Region identify target fish and shellfish tissue concentrations consistent with the 2017 Directive and the approach used for the Lower Duwamish Waterway remedy.*

### **Region 10 Response:**

The Region agrees that target tissue concentrations (TTCs) allow for a direct and reliable measure of risk to people consuming seafood and will include TTCs in the PP and ROD. In a manner similar to the LDW, the Region has established resident fish and shellfish (crab and clam) target tissue concentrations to measure progress toward achieving RAO 1; however, the TTCs will not be used as cleanup levels. They will instead be used for informational purposes to assess ongoing risks to people who may consume resident LDW fish and shellfish. Tissue monitoring data will also inform the content or degree of any potential future fish advisories, other ICs intended to minimize risk to the LDW fishing community, or other response actions that may be identified in a ROD Amendment or ESD.

In setting these TTCs, the Region considered approaches which are consistent with developing Sediment Cleanup Levels (SCLs) protective of humans, including sensitive subpopulations. The TTCs are based on the higher of the following:

- The tissue RBTC at  $1 \times 10^{-6}$  excess cancer risk or HQ of 1 for the adult Tribal RME scenario; or,
- The current concentrations in non-urban (natural background) Puget Sound tissue data.

The natural background tissue concentrations were developed from a series of tissue studies in Puget Sound similar to those used to develop tissue levels for the LDW, including non-urban datasets. The resulting background values are similar to those in the LDW ROD, with the addition of a natural background concentration for rockfish, a receptor not found in the LDW. TTC values will be included in the Proposed Plan and ROD. Supporting information on the derivation of these values will be included in the Administrative Record.

*Recommendation 21: Since remedy implementation is anticipated to take approximately 10-13 years, the boards recommend that the Region consider developing and implementing a monitoring plan, including establishing baseline conditions “during remedy implementation and as long as necessary thereafter to ensure that all sediment risks have been adequately managed.” The monitoring’s focus should be the media included in the RAOs. As described in the 2017 sediment directive, “The monitoring endpoints used to measure progress towards or achievement of RAOs (e.g., fish tissue contaminant concentration or benthic toxicity) are site-specific and should directly indicate the RAO and be linked to the remediation (i.e., the remediation is intended to directly affect those receptors).”*

**Region 10 Response:** The Region will conduct both baseline and long-term monitoring programs, including monitoring contaminant concentrations in fish and shellfish identified in the HHRA. Tissue baseline studies will be conducted prior to remedy implementation and post-construction monitoring is expected to occur a minimum of every five years for an indefinite period of time until sediment and tissue goals are met. The monitoring will be used to support the five-year reviews and to inform the institutional controls and fish consumption advisories. This will be clearly indicated in the PP and ROD.

## **Site Characterization of Slip 36**

### ***NRRB/CSTAG Comment:***

*Based on the information provided to the boards, there appears to be a significant data gap with respect to sediment characterization (e.g., depth of contamination, potential COCs) within Slip 36, which the United States Coast Guard owns and operates.*

*Recommendation 23: The boards recommend that the Region engage with the Coast Guard to implement additional studies consistent with their federal responsibility as an owner and operator under CERCLA.*

**Region 10 Response:** Under EPA direction, the U.S. Coast Guard (USCG) conducted sediment sampling beneath Pier 36B in March 2015 as part of planned pier repair work. The results showed high concentrations of PAHs and tributyltin in the under-pier sediment. This preliminary data was collected outside of the CERCLA sampling effort so further assessment is needed to adequately characterize under-pier sediment quality.

Following ongoing discussions between Region 10 staff and the USCG, EPA received a draft Sampling and Analysis plan in November 2018. The planned sampling will define the extent of contamination near and under Pier 36 and evaluate potential sources, with a goal of determining if remediation is required and evaluating potential remediation alternatives. This sampling is scheduled for summer 2019. EPA continues to work with USCG to characterize the extent of contamination within Slip 36 but this remains an ongoing challenge.

## **Early Actions**

### ***NRRB/CSTAG Comment:***

*Based on the information provided to the boards, the preferred alternative does not incorporate early actions. Both the January 2017 sediment directive and the Superfund Task Force promote use of adaptive management as well as early actions and interim remedies under appropriate circumstances.*

*Recommendation 24: The boards recommend that the Region consider early actions for potential higher source areas, such as the Coast Guard slip or areas with significant prop wash effects.*

**Region 10 Response:** While the Region's goal is to implement a final remedy as soon as practicable, ongoing assessments at the USCG Slip 36 may prove that early actions are warranted. As described in the response above, the USCG is currently planning additional characterization at Slip 36 in summer 2019. Based on results of this sampling, the Region will determine if an early action at Slip 36 is appropriate.

## **Cost**

### ***NRRB/CSTAG Comment:***

*The package provided to the boards states that the net-present value costs were calculated without a discount rate, contrary to “A Guide to Developing and Documenting Cost Estimates During the Feasibility Study (OSWER Directive No. 9355.0-75, July 2000), which calls for a 7 percent discount rate. Pursuant to the cost estimate guidance, the 7 percent discount rate and a sensitivity analysis may be included in decision documents, though the 7 percent discount rate should be the basis for the nine-criteria analysis.*

*Recommendation 22: The boards recommend that the Region include a 7 percent discount in the decision documents as well as a sensitivity analysis using a lower discount rate.*

**Region 10 Response:** The Region will provide cost estimates using a 7% discount rate in the Proposed Plan and Record of Decisions, with supporting information in the Administrative Record. However, since the publication of that guidance, the lending environment has significantly changed; current discount rates, as recommended by the Office of Management and Budget (OMB, 2018) range from - 0.8% to 0.6%. For this reason the Region will also retain the original analysis which incorporates a 0% discount rate.

OMB (Office of Management and Budget). 2018. *Circular A-94 Appendix C: Discount Rates for Cost-Effectiveness, Lease Purchase, and Related Analyses, Revised November 2017*. Published 8 February 2018. Available from: <https://www.federalregister.gov/documents/2018/02/08/2018-02520/discount-rates-for-cost-effectiveness-analysis-of-federal-programs>. Accessed 8 Feb 2019.